PROCEEDINGS

OF

THE ROYAL SOCIETY.

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November 27, 1845.

The MARQUIS OF NORTHAMPTON, President, in the Chair.

"Experimental Researches in Electricity." By Michael Faraday, Esq., D.C.L., F.R.S., &c. Nineteenth Series. Section 25: On the Magnetization of Light, and the Illumination of Magnetic Lines of Force.

For a long time past the author had felt a strong persuasion, derived from philosophical considerations, that among the several powers of nature which in their various forms of operation on matter produce different classes of effects, there exists an intimate relation; that they are connected by a common origin, have a reciprocal dependence on one another, and are capable, under certain conditions, of being converted the one into the other. Already have electricity and magnetism afforded evidence of this mutual convertibility; and in extending his views to a wider sphere, the author became convinced that these powers must have relations with light also. Until lately his endeavours to detect these relations were unsuccessful; but at length, on instituting a more searching interrogation of nature, he arrived at the discovery recorded in the present paper, namely, that a ray of light may be electrified and magnetized; and that lines of magnetic force may be rendered luminous.

The fundamental experiment revealing this new and important fact, which establishes a link of connexion between two great departments of nature, is the following. A ray of light issuing from an Argand lamp is first polarized in the horizontal plane by reflexion from a glass mirror, and then made to pass, for a certain space, through glass composed of silicated borate of lead, on its emergence from which it is viewed through a Nichol's eye-piece, capable of revolving on a horizontal axis, so as to intercept the ray, or allow it to be transmitted, alternately, in the different phases of its revolution. The glass through which the ray passes, and which the author terms the *diamagnetic*, is placed between the two poles of a powerful electro-magnet, arranged in such a position as that the line of magnetic forces resulting from their combined action shall coincide with, or differ but little from the course of the ray in its passage through the glass. It was then found that if the eye-piece had been so turned as to render the ray invisible to the observer looking through the eye-piece before the electric current had been established, it becomes visible whenever, by the completion of the circuit, the magnetic force is in operation; but instantly becomes again invisible on the cessation of that force by the interruption of the circuit. Further investigation showed that the magnetic action causes the plane of polarization of the polarized ray to rotate, for the ray is again rendered visible by turning the eye-piece to a certain extent; and that the direction of the rotation impressed upon the ray, when the magnetic influence is issuing from the south pole, and proceeding in the same direction as the polarized ray, is right-handed, or similar to that of the motion of the hands of a watch, as estimated by an observer at the eye-piece. The direction in which the rotation takes place will, of course, be reversed by reversing either the course of the ray or the poles of the magnet. Hence it follows that the polarized ray is made to rotate in the same direction as the currents of positive electricity are circulating, both in the helices composing the electro-magnet, and also in the same direction as the hypothetical currents, which, according to Ampère's theory, circulate in the substance of a steel magnet. The rotatory action was found to be always directly proportional to the intensity of the magnetic force, but not to that of the electric current; and also to be proportional to the length of that portion of the ray which receives the influence. The interposition of substances which occasion no disturbance of the magnetic forces, produces no change in these effects. Magnets consisting only of electric helices act with less power than when armed with iron, and in which magnetic action is consequently more strongly developed.

The author pursues the inquiry by varying in a great number of ways the circumstances in which this newly-discovered influence is exerted; and finds that the modifications thus introduced in the results are all explicable by reference to the general law above stated. Thus the effect is produced, though in a less degree, when the polarized ray is subjected to the action of an ordinary magnet, instead of one that derives its power from a voltaic current; and it is also weaker when a single pole only is employed. It is, on the other hand, increased by the addition of a hollow cylinder of iron, placed within the helix, the polarized ray traversing its axis being then acted upon with great energy. Helices act with equal power in any part of the cylindric space which they enclose. The heavy glass used in these experiments was found to possess in itself, no specific magneto-inductive action.

Different media differ extremely in the degree in which they are capable of exerting the rotatory power over a polarized ray of light. It is a power which has no apparent relation to the other physical properties, whether chemical or mechanical, of these bodies. Yet, however it may differ in its degree, it is always the same in kind; the rotation it effects is invariably in one direction, dependent, however, on the directions of the ray and of the magnetic force. In this respect it differs essentially from the rotatory power naturally possessed by many bodies, such as quartz, sugar, oil of turpentine, &c., which exhibit the phenomena of circular polarization; for in some of these the rotation takes place to the right, and in others to the left. When, therefore, such substances are employed as diamagnetics, the natural and the superinduced powers tend to produce either the same or opposite rotations; and the resulting effects are modified according as they are cumulative in the former case, and differential in the latter.

In the concluding section of the paper, the author enters into general considerations on the nature of the newly-discovered influence of electricity and magnetism over light, and remarks that all these powers possess in common a duality of character which constitutes them a peculiar class, and affords an opening which before was wanting for the appliance of these powers to the investigation of this and other radiant agencies. The phenomena thus brought to light confirm the views entertained by the author relative to the constitution of matter as being spheres of power, for the operation of which the conception of a solid nucleus is not necessary; and leads to the presumption that the influence of magnetism on bodies which exhibit no magnetic properties consists in producing in them a state of electric tension tending to a current; while on iron, nickel, and other bodies susceptible of magnetism, currents are actually established by the same influence.

The author states that he is still engaged in the prosecution of these inquiries.

"On the Action of the Rays of the Spectrum on Vegetable Juices:" being an Extract from a Letter by Mrs. M. Somerville to Sir John F. W. Herschel, Bart., dated Rome, September 20, 1845. Communicated by Sir John F. W. Herschel, Bart., F.R.S.

In the experiments of which the results are here recorded, the solar spectrum was condensed by a lens of flint glass of seven inches and a half focus, maintained in the same part of the screen by keeping a pin-hole or pencil-mark constantly at the corner of the red rays, which were sharply defined by being viewed through blue spectacles; and the apparatus was covered with black cloth in order to exclude extraneous light. Thick white letter-paper, moistened with the liquid to be examined, was exposed wet to the spectrum, as it was found that the action of the coloured light was thus rendered more immediate and more intense, than when the surface of the paper was dry.

The action of the spectrum at the junction of the lavender with the violet rays was found in some cases to be different from what it is with either of these colours separately, indicating a break in the continuity of action, and suggesting the idea of a secondary spectrum. In many instances the yellow and green rays exert a powerful influence on vegetable substances, an influence apparently unconnected with heat; for the darkening is generally least under the red rays and immediately below them, where the calorific rays are most abundant. The action, in a great number of cases, produces insulated spots in different parts of the spectrum, but more especially in the region of the rays of mean refrangibility, in which neither the calorific nor the chemical powers are the greatest. The point of maximum intensity is sometimes altered by the addition of acids, alkalies, or diluted alcohol. But altogether, as the author states, the action of the different parts of the spectrum seems to be very capricious, the changes of colour produced being exceedingly irregular and unaccountable.

December 1, 1845.

At the Anniversary Meeting,

The MARQUIS OF NORTHAMPTON, President, in the Chair.

Captain Smyth, on the part of the Auditors of the Treasurer's Accounts, reported, that the total receipts during the past year, inclusive of a balance of 1940*l.* 12*s.* 8*d.*, carried from the account of the preceding year, amounted to 5110*l.* 11*s.* 3*d.*; and that the total amount of payments in the same period amounted to 3033*l.* 19*s.* 5*d.*, leaving a balance in the hands of the Treasurer of 2076*l.* 11*s.* 10*d.*

The thanks of the Meeting were given to the Auditors for the trouble they have taken in examining the Treasurer's Accounts.

The Secretary then read the following lists of deceased Fellows of the Royal Society, and of those admitted into the Society since the last Anniversary in 1844.

List of Fellows of the Royal Society deceased since the last Anniversary (1844).

On the Home List.

David Francis Atcherley, Esq.
George Basevi, Esq.
George Henry Law, Lord Bishop of Bath and Wells.
Rev. William Frederick Baylay.
John Laurens Bicknell, Esq.
Samuel Bosanquet, Esq.
Right Hon. William Sturges Bourne.
John Frederic Daniell, Esq., For. Secretary.
Rev. Henry Coddington.
Very Rev. Edmund Goodenough, Dean of Wells.
William Heberden, M.D.
Thomas Phillips, Esq., R.A.
John Ramsbottom, Esq.
Martin Tupper, Esq.
The Marquis of Westminster, K.G.
Sir Isaac Wilson, Knt., M.D.

On the Foreign List.

Le Comte de Cassini.
Théodore de Saussure.

Ceased to be Fellows in default of their Annual Payments.

Robert Grymbald Bigsby, Esq.
Henry Napier, Esq., Capt. R.N.
Rev. George Glover, Archdeacon of Sudbury.

List of Admissions into the Royal Society since the last Anniversary (1844).

On the Home List.

Adair, Robert Shafto, Esq.
Bandon, Right Hon. the Earl of.
Barlow, Peter William, Esq.
Barrow, John, jun., Esq.
Dickenson, John, Esq.
Falconer, Hugh, M.D.
Forbes, Edward, Esq.
Fownes, George, Esq.
Harrison, Thomas Charles, Esq.
Jackson, Colonel Julius.
Johnston, Alexander Robert, Esq.
Martin, James Ranald, Esq.
Miller, William Allen, M.D.
Monteith, Major-Gen. William.
Rennie, James, Esq.
Simon, John, Esq.
Sopwith, Thomas, Esq.
Stebbing, Rev. Henry, D.D.
Taylor, Alfred Swaine, Esq.
Thesiger, Sir Frederick.
Tupper, Martin Farquhar, Esq.
Washington, John, Esq., Capt. R.N.
Wilson, Erasmus, Esq.
Wilson, Rev. John, D.D.

The President then addressed the Meeting as follows:—

GENTLEMEN,

I DEEPLY regret that I have to commence my address to you by lamenting, in common with the whole Society, that after many years of the most valuable services, Sir John Lubbock has resigned the situation of your Treasurer. As he is now not generally resident in London, he feels the inconvenience of the necessary attendance on your business so great, that we cannot further urge his retention of that important office. I am quite sure that I shall be no unfaithful interpreter of your feelings when I thus publicly express your thanks and regrets, as well as my own, and those of your Council.

The practice which has been recently introduced of stating as far as possible at the conclusion of one meeting, the subjects of papers to be read on the following Thursday, will, I have no doubt, be found most useful, and can, I think, be accompanied by no drawbacks. I am aware that the introduction of discussion on papers after they have been read can hardly be expected to meet with universal concurrence. It may certainly be attended with some inconvenience. It therefore appears to me to be indispensably necessary that the President, or the Vice-President in the Chair, should have, and exercise the absolute power, both of abstaining from an invitation to discuss papers, which from their abstract nature, or from any other cause are little calculated for discussion, and also of checking conversation when it becomes either intemperate and personal, inconveniently long, or in any other manner not desirable to be continued. So checked and guarded, I believe that it will give our meetings more spirit and more interest, and will at the same time promote the investigation of physical truth, and so most efficiently fulfil the objects for which the Society itself was instituted.

It appears to me, and your present Council have concurred in the opinion, that the period of our Anniversary, in the gloomy month of November, and at a time when London is comparatively deserted, is extremely inconvenient. It is very inconvenient for your Council itself, which is obliged more than once to assemble for the purpose of preliminary arrangements before the commencement of our autumnal evening meetings. It is also very inconvenient to the body at large, and in truth has a tendency to restrict the assembly of our members on the important day of the election of the new Council to those who are resident in London. At the time when St. Andrew's day was selected, the London season commenced much earlier than it now does, and it was probably the best fitted for securing a large attendance. I shall certainly, if I again occupy the honourable situation of your President, bring the question before your new Council, but it is not yet clear how this inconvenience can be obviated.

The magnetic observations that have now for several years been carried on simultaneously at different establishments by our own and other governments, were not undertaken by Her Majesty's Government for a longer period than the termination of the present year. It was therefore deemed advisable to invite the conductors of those observations in foreign countries, to communicate their opinions in writing, and after doing so, to come over to England at the time of the meeting of the British Association. It was proposed then to hold a congress for the consideration of the propriety of continuing the magnetic observations. Such a congress met at Cambridge last summer, probably the largest combination of men of the highest attainments in science from every part of Europe that ever met together in a scientific parliament, whose object was the solution of some of the most interesting problems in natural philosophy. There were to be seen together the Astronomers Royal of England and Ireland, Dr. Lloyd, and Colonel Sabine, who had taken the most active part in arranging and combining the joint magnetic operations, Sir John Herschel, the President of the British Association, his immediate predecessors the Dean of Ely, and Lord Rosse, and many other gentlemen whom the Royal Society is proud to name among her Fellows, together with the representatives of the highest science of the continent. That, as your President, I should have had the opportunity of taking even the humblest part in such a meeting will ever be esteemed by me one of the highest honours to which your too favourable consideration has raised me. After anxious deliberation, the Congress recommended to the British Government and to the East India Company the continuation of the observations on a modified, and in some respects a reduced scale. To the Council of the Royal Society, some of whose members had already taken an active part in the deliberations of the Congress, I reported the resolutions adopted at Cambridge, and the Council unanimously agreed to recommend them also to Sir Robert Peel. I therefore signified our wishes to the Prime Minister and to the Directors of the East India Company; I rejoice to say that they have both given their consent to the adoption of the united recommendation of the Royal Society and the British Association, and it only remains for me to express to them the gratitude of the world of science. I have strong reasons to believe that the other governments who have carried on joint observations with us, will also continue them with some modification, and thus that we shall continue to see the world united by important scientific inquiries carried on in common,—a pledge of peace and friendship, and a proof of the growing conviction that it is the real interest of every civilized government to promote physical science.

I am happy to be able to announce the safe return to the Cape of Good Hope of the vessel which, at the request of the Royal Society, was sent by Her Majesty's Government under the direction of Lieut. T. E. L. Moore of the Royal Navy, and Lieut. Henry Clerk of the Royal Artillery, to complete the magnetic survey of the high latitudes of the southern hemisphere, of which three-fourths had previously been accomplished by the expedition under Sir James Clark Ross. The Pagoda left the Cape of Good Hope in January last, making a course to the southward in the meridian of Greenwich, until her further progress in that direction was stopped by the ice in the vicinity of the Antarctic Circle. Thence she proceeded to the eastward, keeping as near the edge of the ice as circumstances would permit, until the close of the season of navigation in those latitudes, when she had passed the meridian of 120° E. and had connected her survey with that of Sir James Ross's expedition. Lieutenants Moore and Clerk are on their way to England with their magnetic observations, of which the results will eventually be presented to the Royal Society. I am happy to add, that this service has been performed without accident or loss of life.

Since our last Anniversary, Sir John Franklin and Captain Crozier have left the shores of England for the purposes of discovery in the other cold regions of the globe. As the Government previously consulted the Council of the Royal Society on the importance of such an expedition to the cause of geographical science, we must naturally feel a deep interest in its success. It would be presumptuous to speculate on the solution of the problem of a North-west Passage. Barriers of ice may prove insurmountable, but we may confidently trust that every thing will be done that energy and experienced skill can effect, by an expedition which goes out with mechanical advantages that attended none of the former attempts of a Parry and a Ross.

The year that has now elapsed has had thrown over it a dark gloom by a most melancholy and awful event. I need not say that I allude to the deeply lamented death of our late Foreign Secretary, Mr. Daniell. That a soldier should fall in the battle-field, or that a sailor should meet with a glorious death on the deck of a man-of-war, or lose his life in the storms that have wrecked so many gallant vessels, seems a natural as well as honourable termination to the career of each. Professor Daniell's valuable life came to a close as sudden, while he was engaged in performing his duty as a man of science—his duty as one of our officers—in his attendance on one of our Councils—an awful proof of the uncertainty of human life, even while no danger seems to impend. We propose, in the room of Mr. Daniell, Colonel Sabine as your Foreign Secretary; a gentleman not only ardently zealous for science in general, but also one of those who have taken the most active share in those magnetical inquiries to which I have already adverted, and which are so interesting to the Royal Society from our part in them since their commencement. These magnetical inquiries have occasioned much necessary intercourse between Colonel Sabine and the scientific men of the continent, and therefore form an additional recommendation of that gentleman as our Foreign Secretary.

In recommending an engineer so eminent as Mr. Rennie to the office of Treasurer, I need hardly advert to the scientific acquirements indispensable in his profession. Nor is it necessary for me to remark, that it is an office that should be held by one that is a man of business as well as a philosopher, an union of qualities not found in all, though so happily united in a Baily and a Lubbock; but it is right in mentioning that profession for me to express my regret that gentlemen should have been publicly advertised as Fellows of this Society who do not possess that honour; at the same time it is but fair to say, that in all probability the misstatement arose from mistake alone in the Secretaries of the advertising companies, and I entertain no doubt that greater care will be taken for the future to avoid similar errors.

Your Assistant Secretary, in his capacity of Librarian, has compiled a Catalogue of the Maps, Charts and Surveys, in the possession of the Society, which have been accumulating for many years. These amount to several thousands, and they are now arranged in such a manner as to be immediately accessible to the Fellows. Catalogues have also been made of the miscellaneous drawings and engravings of scientific subjects, and likewise of the valuable and interesting collection of portraits of the distinguished deceased Fellows of the Society.

The Library has been enriched during the past Session by a very perfect copy, on vellum, of the magnificent work, entitled 'Description de l'Égypte,' consisting of nine volumes of letter-press, and fourteen imperial folio volumes containing 930 engravings, illustrative of the antiquities and natural history of Egypt. It has also received the valuable present of a considerable number of Chinese books from Mr. Walker of Preston; at present the Chinese language is so little known that these are likely to be useful to very few of our Fellows. The increased facilities, however, now existing for communication with the great kingdom of China, will probably lead to much greater study of its difficult language, so that these works may become a very valuable and interesting portion of our Library.

Mr. Astronomer Royal,

It is now my duty to announce to you that a Royal Medal has been adjudged to you by the Council for your important inquiry into the Tides on the Coast of Ireland. It is a great gratification to me to give a medal, conferred by his sovereign, to one to whom is committed the charge of the great scientific establishment of England, for investigations carried on with consummate scientific ability, connected with the mighty element on which his country has reaped so much glory, and to which she owes so much of her wealth and of her safety. If the day of necessity should ever arrive, I doubt not that her sons will emulate the achievements of their predecessors. Now, in the happier times of peace, it is gratifying to see British skill and British science gathering bloodless, but unperishing laurels on the same field, and by so doing ministering with no unselfish hand to the safety of all who pursue the avocations of commerce.

Mr. Beck,

A Royal Medal has been adjudged to you by the Council of the Royal Society, complying thereby with the recommendation of the Committee of Physiology, for your researches into one of the most important subjects of anatomical inquiry*. In presenting it to you,

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* The report of the Committee of Physiology on the claims of Mr. Beck's paper to the award of the Medal, is as follows:—

"The paper of Mr. Beck contains the result of an elaborate anatomical investigation of the Nerves of the Uterus, together with observations on the structure and connexions of the sympathetic nerve.

"By his researches the author has cleared up various points concerning the nerves of the uterus which have hitherto been doubtful or misunderstood. He has determined more precisely than heretofore the source and mode of distribution of these nerves, and the real extent to which the organ is supplied with them. The true nature of the nervous ganglia at the neck of the uterus, and of the plexuses formed by the sympathetic and sacral nerves in the same situation, is also satisfactorily made out, as well as the fact that the branches derived from the sacral nerves are not destined for the uterus, but are distributed to adjacent organs.

"With regard to the sympathetic nerve, it is shown that there are both grey and white separate branches of communication between that nerve and the spinal nerves. This important fact has, it is true, been already pointed out in the recently published work of Todd and Bowman, but the author of the paper has nevertheless the merit of arriving at it independently, by his own observations. He has further shown that the white and grey constituents of the nerve keep distinct from each other, not only in the so-called trunk of the sympathetic, but also in its primary branches, as far as the visceral ganglia, beyond which the white and grey parts become intermixed in the nerves distributed to the viscera. The precise mode of connexion of the white and grey communicating branches with the spinal nerves is also carefully investigated. These observations appear important as tending to throw light on the constitution of the sympathetic nerve and its relation to the rest of the nervous system.

"The Committee consider the paper of Mr. Beck as a most valuable contribution to the Anatomy of the nervous system, and as affording addi-

I may be allowed to express my hope that you will continue your researches, and that others of your profession may be encouraged to do so likewise, so that in the result our information may become more perfect and full than we yet possess on points of very difficult solution.

I trust that the consequence of discoveries thus made will be a diminution of those dangers, and an alleviation of those pains which are the price paid for the entry into the world of every human being.

The purpose for which the Royal Society was established was indeed the improvement of natural knowledge for its own sake; but we can never forget that the privilege of acquiring that knowledge entails the duty of employing it to the utmost of our power, not only to the glory of Him who has given us our reasoning powers, but also to the service, as far as may be, of those who are His creatures.

Mr. Owen,

I have the pleasure of requesting you to transmit the Copley Medal to your friend Mr. Schwann, for his valuable work on the Analogies of Vegetables and Animals. This subject is one of the deepest interest to the natural philosopher, for what can be more important than to trace those analogies by which the two great kingdoms of nature are united, and which show that the same wisdom has directed every portion of the creation? It is also a large and not easily exhausted field of inquiry, and being so, I trust that he who has already so ably cultivated it may reap from it still larger harvests of scientific discovery.

I now proceed to the biographical notices of some of our deceased members.

Dr. William Heberden, the son of the eminent and accomplished author of the 'Commentaries on the History and Cure of Diseases,' was born in London in the year 1767. At the early age of seven, he was sent to school at the Charter House, and appears to have there made rapid progress in the elementary branches of education. His academical studies were pursued in St. John's College, Cambridge, where he highly distinguished himself both by his mathematical and his classical acquirements. Under his father's tuition he applied himself with great diligence to his profession as a pupil of St. George's Hospital, to which, at a subsequent period, he was appointed one of the Physicians. He was elected a Fellow of this Society in the year 1791: and in 1797, became a Fellow of the College of Physicians. His practice soon became tolerably extensive. On the death of Sir George Baker in 1809, he succeeded him

tional and more precise data for physiological reasoning respecting the nerves to which it refers. On these grounds, as well as on account of the consummate skill and devoted perseverance displayed by the author in his arduous investigations, they have recommended that his paper be rewarded with the Royal Medal."

in the appointment of physician to the King, whose favour he soon conciliated, and by whom he was more than once offered a baronetcy and a pension, distinctions which his high-minded aversion to dependence and ostentation always induced him to decline. The ambition of great professional success appears to have been superseded by his fondness for literary pursuits, diverting him by degrees from the laborious exertions and exclusive devotion which are ever requisite for rising to the higher eminences in medicine; for we find him, in 1812, when suddenly left a widower with a family of nine young children, gradually relinquishing practice, and retiring from active life to the village of Datchet, in Buckinghamshire, where for the ensuing fourteen years, he devoted himself to the superintendence of his children's education, to the cultivation of letters, and the enjoyment of a select society. It was during this period that he amused himself with translating Cicero's Letters to Atticus, which he subsequently published. He was also the author of a short Treatise on General Education; a subject which, from the peculiar circumstances in which he was placed, had anxiously occupied his mind. This was followed by a translation of that part of the Moralia of Plutarch that relates to brotherly love, which he dedicated to his children.

In the year 1826, he again came to reside in London, principally with the view of contributing by his instructions to advance his son in those professional studies which he was pursuing in the same hospital, from which he had himself derived a large portion of his practical knowledge. But in this, his fondest hope, he was doomed to suffer the most cruel disappointment; for the brilliant career of which that favourite son was giving auspicious promise, was suddenly closed in death, occasioned by the reception of poisonous matter during a post-mortem examination. Other domestic calamities followed in quick succession: the loss of another son, and of his eldest daughter, overshadowed his declining years with the deepest gloom, which found relief only in religious contemplation, and the composition of various works illustrative of the Scriptures. He died on the 19th of February, 1845, aged 77.

His contributions to the Philosophical Transactions consist of two papers; the first in 1796, on the influence of cold on the health of the inhabitants of London; in which he shows, in opposition to the popular prejudices then prevalent, that a severe winter is attended with greatly increased mortality. The second paper is entitled "On the heat of July 1825, together with some remarks on sensible cold," in which he points out the causes which influence our sensations of temperature, and more especially the powerful effect of wind in increasing the rate of cooling, and consequently of creating the sensation of cold in the human body, independently of any actual depression in the temperature of the air.

JOHN FREDERIC DANIELL was born in Essex Street, Strand, 12th of March, 1790. His father, George Daniell, Esq., Bencher of the Inner Temple, provided him with a good classical education under his own roof. At an early age he showed fondness for the pursuits of science, and was placed in the sugar refining establishment of a relative, where he introduced important improvements in the manufacture. The pursuits of business, however, were uncongenial to his tastes, and he soon relinquished this occupation. In 1813 he was elected a Fellow of the Royal Society, of which body he continued till the day of his death a zealous and active member.

The services he rendered to more than one branch of science were of no ordinary description. From an early period of his life his mind was directed to the study of meteorology, at a time when it consisted of little more than a vast accumulation of facts and observations.

In the year 1823 he published the first edition of his 'Meteorological Essays,' which constituted a new epoch in the science, and still continues the standard work of reference, the third edition of which he had nearly completed at the time of his death. This was the first attempt to embrace in a general view the scattered facts of the science, and by synthetically applying the known laws which regulate the constitution of gases and vapours, the principles of their equilibrium, and the distribution of heat among them, to give a connected account of the main phenomena of the earth's atmosphere. He insisted on the paramount importance of extreme accuracy in the construction of the instruments employed for such inquiries, and gave directions by which the needful accuracy could with certainty and facility be obtained. By the invention of the hygrometer, which bears his name, he first conferred precision on the means of ascertaining the moisture or dryness of the atmosphere, a point of cardinal importance in all investigations of this nature; his instrument still continues that which can be best depended upon for this purpose. With these accurate instruments, he for three years kept a faithful register of the various atmospheric changes; he organized the plan adopted by the Horticultural Society in their annual meteorological reports, a plan which formed the model to the admirable and more extended series of meteorological observations now issued weekly from the Greenwich Observatory under the superintendence of the Astronomer Royal.

In the year 1824 he communicated to the Horticultural Society an essay 'On Artificial Climate,' which appeared in their Transactions for that year. In this paper among other subjects he insisted on the absolute necessity of attention to the moisture of the atmosphere, as well as of that of maintaining in our hot-houses the moisture as well as the temperature of a tropical climate, if we would produce a vegetation of tropical luxuriance. The publication of this essay caused a complete change in the methods adopted for the culture of plants in general, and particularly of those contained in greenhouses and hot-houses, which upon the new plans speedily outgrew the houses provided for their reception. The Society immediately awarded him their silver medal to mark their sense of the importance of his views, and now after an experience of more than twenty years, Dr. Lindley, Professor of Botany in University College, not a fortnight before his death, in an article in the Gardener's Chronicle, tracing the origin of the improvements in this branch of horticulture, ascribes the rapid advance in the practice of the art, mainly to the sound and original views promulgated in this essay.

For the purpose of making more minute and accurate observations upon variations in the atmospheric pressure, Mr. Daniell proposed to the Royal Society, in 1830, to construct a barometer in which water should be the fluid used instead of mercury. He was in consequence requested to superintend the construction of such an instrument. Great practical difficulties attended the undertaking, but these he happily surmounted, and the instrument now stands in the Hall of the Apartments of the Royal Society; he was engaged in re-adjusting it within a few weeks of his decease. On occasion of the late Antarctic Expedition under the command of Captain Sir James Ross, and the establishment by Government of the Magnetic and Meteorological observations, founded a few years since in different parts of the British Empire, when the Admiralty applied to the Royal Society for instructions as to the nature and extent of the observations to be made, Mr. Daniell was requested by the Committee of Physics of the Royal Society, to draw up the Meteorological portion of these directions. The paper which he then prepared furnished the basis of that part of the Report of the Committee, published in the year 1840, under the sanction of the Royal Society.

But it was not alone to meteorology, and its practical applications, that his labours were confined; his researches upon various chemical subjects were not less numerous or important. More than forty original papers, including thirteen on meteorology, were communicated by him to various scientific publications; among others he published several memoirs on Crystallization, and its attendant phenomena. Between the years 1830 and 1844, the Transactions of this Society were enriched by twelve papers on important subjects from his pen. He invented a process for making gas from resin for the purposes of illumination, by which the streets of New York are lighted at the present time. For this improvement he received no other acknowledgment than a vote of a few pounds' worth of books. In the year 1830, he described in the Philosophical Transactions, a new instrument for measuring high degrees of heat, such as the temperature of furnaces, and the melting-points of metals. By means of this, his pyrometer, he ascertained numerous facts of great interest both in a scientific and in a practical point of view. For the invention of this instrument, which is still the best for the objects intended, the Royal Society awarded him the Rumford Medal.

After his appointment as Professor of Chemistry in King's College, his researches were turned principally to the phenomena presented by Voltaic Electricity, and they led to the invention of his constant battery; for this the Royal Society conferred upon him the highest honour in their gift, the Copley Medal for the year 1836. The possibility of maintaining powerful and equable currents of electricity for any required period, was established by this invention.

The impulse thus given to the progress of electrical research cannot be too highly estimated, and to it must be traced the numerous applications of electricity, to the blasting of rocks, the working of mines, and to submarine operations, and to the arts of electro-plating, gilding, zincing, &c., which have recently acquired such magnitude. His subsequent researches in the same field are contained in the Philosophical Transactions, and were honoured by the Society in the year 1842 by one of the Royal Medals. In 1839 Professor Daniell was placed on the Commission appointed by the Admiralty to inquire into the best method of defending the ships in the Royal Navy from lightning, and the same year the Royal Society honoured him with the office of Foreign Secretary to their body. His "Introduction to Chemical Philosophy," published during the course of this year, contributed still further to increase his reputation, and in 1842 he received from the University of Oxford the honorary degree of D.C.L. In consequence of the rapid corrosion of the copper sheathing of the vessels employed upon the African stations, the Admiralty requested him to examine the damaged sheets of metal and the waters taken up from the localities where the corrosion was the greatest; he detected the cause of this decay, showing that sulphuretted hydrogen was abundantly generated in the ocean at these spots, and succeeded in extracting from the metal plates the sulphur which had occasioned their corrosion. It is a remarkable proof of the variety and extent of Mr. Daniell's acquirements, that he received at different times all the medals in the gift of the Royal Society.

The circumstances which attended the sudden and lamented termination of his valuable life, are known to most of the Fellows of this Society. On the 13th of March 1845, after delivering his usual lecture at King's College, apparently in perfect health, he attended the Council Meeting of this Society, and shortly after making some observation upon the business of the meeting, was seized with symptoms indicating an attack of apoplexy. Several medical men who were present hastened to his relief, and he was immediately bled; not the slightest benefit, however, attended this measure, and in five minutes he was a corpse. The shock occasioned by this melancholy event, may be easier imagined than described, and cast a widespread gloom over the extensive circle of his friends and acquaintance. As a mark of respect to his memory, the Noble President postponed the ordinary meeting of the Society, which was to have been held that evening. His remains were interred at Norwood, Surrey, where during the last ten years of his life he had resided.

Mr. Daniell survived his wife eleven years, and left a family of two sons and five daughters to deplore his loss. High as were his scientific attainments, he possessed others of a still loftier and more enduring character; to the sterling qualities of a vigorous understanding, and a kind and benevolent heart, he united the humble and unobtrusive piety of a sincere christian.

Thomas Phillips, R.A., F.R.S., F.S.A., was a native of Dudley in Warwickshire, where he was born on the 18th of October,

1770. He evinced a love of art at a very early age; and after some provincial instruction, at Birmingham, in an inferior branch of painting, he directed his steps to London, where he arrived in the year 1790. He soon placed himself before the public; for in the second year after his establishment in London his name is found among the exhibitors at the Royal Academy of Arts. In the earlier part of Mr. Phillips's career, he appeared as a painter of historical and fancy subjects; but he seems soon to have relinquished this branch of his art for that in which he afterwards became so deservedly eminent; namely, portraiture. In the autumn of 1804, the members of the Royal Academy elected Mr. Phillips an Associate of that Society: four years after, in 1808, he received his full diploma as a Royal Academician. He was elected a Fellow of the Royal Society in 1820. After the decease of Mr. Fuseli, in 1824, he became Professor of Painting in the Royal Academy. Before delivering the customary course of lectures, Mr. Phillips proceeded to Italy to contemplate the works of the great masters preserved at Rome, Florence, Parma, and in other continental collections. On his return to London, the Professor prepared his lectures, which were delivered to the students of the Royal Academy; and they were subsequently printed by him in 1833. These discourses, of which his brother academicians have shown their appreciation by making them part of the prizes bestowed on successful students in the schools of painting, display the intimate acquaintance possessed by their author with the principles and practice of his art. Four of the series are on the History of Painting; others on Invention, Design, Composition, Colouring, Chiaroscuro, and the application of the principles of painting. They form altogether an admirable treatise on the art; they abound with sound philosophical views and just criticism, united with excellent practical advice and instruction, conveyed in clear and unaffected language. They are a highly valuable contribution to the class of literature to which they belong, and are most honourable to the ability and taste of their lamented writer.

For above forty years of his life Mr. Phillips was in full practice as a portrait-painter; and among his sitters were many of the most exalted and eminent men of his age. It is unnecessary to attempt to notice all the works which proceeded from his constantly employed pencil; but a few of his more important pictures may with propriety be referred to. Among the most interesting subjects whose likenesses are preserved to us by his skill, may first be classed those Presidents of the Royal Society whose portraits now decorate the walls of the room in which our ordinary meetings are held, namely, His Royal Highness the Duke of Sussex, Sir Joseph Banks, and Mr. Davies Gilbert. Among those of scientific and literary characters, it is gratifying to refer to pictures of the present Dean of Westminster (Dr. Buckland), Dr. Dalton, Professor Sedgwick, Mrs. Somerville, Francis Baily, and Professor Faraday; as well as those of Byron, Scott, Southey, Coleridge, Campbell and Hallam. These are but a few,—but they are among the best of his works,—

out of the large number of portraits in which Mr. Phillips has shown his just comprehension of character, his taste in arrangement, truth to nature, and a fine eye for colour.

Mr. Phillips's health had long been declining. His death occurred on Sunday the 20th of April, 1845, in his seventy-fifth year. He was greatly and most deservedly respected and esteemed by a large circle of friends, whom his high talents, amiable disposition, and gentlemanlike feelings and manners had drawn around him; and his loss will long be sensibly felt; especially in that profession of which he was so distinguished a member. He married early in life; and has left, besides other children, a son who is following the same profession as himself.

The arts have sustained a serious loss by the melancholy death of Mr. George Basevi, an architect of distinguished reputation and of still greater promise.

Mr. Basevi began his professional education under Sir John Soane, and subsequently prosecuted it with great diligence and success in Greece and Italy; he was passionately attached to his art, and there was no accomplishment or branch of knowledge bearing upon it which he failed to cultivate or acquire. His Fitzwilliam Museum at Cambridge, and the New Conservative Club House in St. James's Street, not to mention his other works, will be durable monuments of his genius and taste. He was a man of excellent sense and judgment, a scrupulous lover of truth, and singularly upright in all his dealings: though his manners to some persons might appear cold and unimpassioned, he was ardent in his affections and exemplary in all the relations of domestic life. He was inspecting the works in progress in the western tower of Ely Cathedral, and whilst stepping backwards upon a broad beam, from the sides of which the flooring for a short distance had been removed, his foot tripped and he fell through the opening upon the timbers of the vault beneath, and was killed on the spot. He was buried in Ely Cathedral with every mark of respect, which was equally due to his private virtues and to the affecting circumstances attending his death.

Jaques Dominique Cassini, Compte du Thury, was elected a Foreign Member of this Society in 1789, and at the time of his death had attained the extraordinary age of 97 years: he was the fourth in direct descent of a family which, during a period of nearly two centuries, has been singularly illustrious in the history of the sciences, and more particularly of astronomy. His great grandfather, Jaques Dominique Cassini, one of the greatest astronomers of his age, was born in 1625, and was invited by Louis XIV. from Italy to France, to preside over the magnificent Observatory of Paris, which was built under his directions: his first successor in the direction of this establishment was his son Jean Jaques, an astronomer not less eminent than himself; the second his grandson, more commonly designated as Cassini de Thury, so well known by his great Geodetical Survey and Map of France; and the third his great grandson, the subject of the present notice, who was displaced from it by the troubles of the Revolution, which involved him, at least for a time, in the common proscription of the aristocracy of France. The shock of these sad events seems to have diverted his mind from scientific pursuits, for we find his name connected with no research in astronomy or geodesy during the last half-century.

The Comte de Cassini completed the celebrated map of France which had been begun by his father. He published an account of voyages which he made in 1768 and 1769, for the trial of the marine chronometers of Le Roy, and a memoir "Sur l'influence de l'équinoxe du printemps et du solstice d'été sur les déclinaisons et les variations de l'aiguille aimantée:" he superintended and published an account of the observations which were made in 1789, by a commission appointed for that purpose, for the junction of the Observatories of Paris and Greenwich, with a special reference to the connection of the Geodetical Survey of France which had been made by his father, with the corresponding Survey of England which was at that time in progress under General Roy: he was the author likewise of "Mémoires pour servir à l'Histoire des Sciences et à celle de l'Observatoire Royal de Paris, suivis de la Vie de Jaques Dominique Cassini, premier du nom."

With him have terminated the honours of the house of Cassini, though he was not the last of his race who distinguished himself in the career of the sciences; his son, Henri Cassini, an upright and enlightened judge in the Cour Royale and the Cour de Cassation, and one of the most learned botanists of his age, fell a victim to the cholera in 1833, and with him died the last stay of the old age of his father: he was the fifth of his family who had been elected a member of the Académie des Sciences. He was a boy at the breaking out of the Revolution, and was compelled, from a regard to his personal safety, to live in the strictest retirement at his father's domain of Thury; a circumstance which turned his attention to the cultivation of Natural History and Botany, and diverted him, as he was accustomed to lament, from those studies and pursuits which formed, as it were, the proper and hereditary honours of his family.

Théodore de Saussure was born in Geneva the 14th of October, 1767. His father, known throughout the civilized world as the geological explorer of the Alps, who first reared observatories on heights almost inaccessible, and who inscribed his name on the eternal snows of the loftiest mountain in Europe, was by profession a physician. Being animated with an ardent love for science, which he cultivated most assiduously, it is not a matter of surprise that after entrusting his son for a short time to a private tutor, he should have undertaken personally his education, so far as to enable him to enter the Academy of Geneva, where young De Saussure soon distinguished himself. Previously to this period, his father had caused him to study medicine, mineralogy, and natural history; and had also inspired him with a taste for experimental chemistry, which he constantly required for the analyses of minerals. By degrees the son became associated with the scientific labours of his father, who records that when he resolved upon attempting the ascent of Mont Blanc, in August 1787, his son, then nineteen years of age, expressed the strongest desire to accompany him; but being apprehensive that he was not sufficiently strong, he was unwillingly obliged to leave him at the Priory at Chamouni, where he made with great care meteorological observations, simultaneously with those carried on at the summit of Mont Blanc. In the month of June of the following year, Théodore de Saussure accompanied his father in the laborious and hazardous expedition to the Col du Géant, where they remained for seventeen days, during which time young De Saussure rose every morning at four o'clock, to commence the meteorological observations, which he continued with unremitting diligence until ten o'clock each night; and so thoroughly did he enter into the scientific pursuits of his parent, that he almost importuned the latter to extend the period of his sojourn amidst those splendid scenes; which was however effectually prevented by the guides, who, alarmed at the idea of a longer stay amidst those icy heights, destroyed all the remaining provisions, necessarily compelling the De Saussures to descend to Cormayeur.

From this period we find Théodore De Saussure always accompanying his father, who was not slow in availing himself of the great advantages derivable from his son's labours. In 1789, they made the very difficult tour of Monte Rosa, it being the first time that the gold mines of Macugnaga were visited by men of science. It was during this excursion that young De Saussure restored by experiments that confidence in the accuracy of the barometer for measuring heights, which the assertion of Bouguer had tended to weaken. He made seventy experiments at different heights, and in calculating the results, was always careful to make the necessary corrections for temperature and humidity, which Bouguer appears to have neglected. The enthusiasm and physical energy of young De Saussure were almost too great for his father, who was now aged, and weakened by various illnesses, and consequently we often find the latter compelled to resist his son's desire to prolong their arduous excursions.

The storms of the Revolution, more powerful than those of the Alps, at length put an effectual stop to these useful scientific excursions, which had been continued for so many years. Théodore de Saussure, in common with many men of his age, was compelled to leave his country. He visited this country with Alexander Marcet, who many years afterwards became his colleague in the Academy at Geneva. After travelling over England and Scotland, he returned to Geneva, and resolved henceforth to devote his life to scientific pursuits. The taste which he had acquired for chemistry under his father's tuition, had been strengthened in England and in France, where that science was eagerly cultivated; and on his return to Geneva, he determined to select the vegetable kingdom for the field of his researches, and zealously applied himself to discover by experiments the influence of the atmosphere and of soils upon plants, and the various chemical changes which they undergo. With the exception of some few accessory labours, M. de Saussure spent a long life upon this branch of science; and it may be truly said that he has done more to advance the knowledge of vegetable physiology than any other person. It is worthy of remark that he laboured seven years silently, before publishing the results of his investigations. These were comprised in his work entitled "Recherches Chimiques sur la Végétation," which appeared in 1804. He subsequently published in the Annales de Physique et de Chimie, the results of his investigations into the action of the petals of flowers upon the atmosphere. The great importance which he attached to the nutritive power of carbonic acid upon plants, directed his attention to the proportion of this gas in the atmosphere. In 1816, he published, in the first volume of the Bibliothèque Universelle, some researches on this subject, which being greatly extended, formed afterwards a paper which was published in 1830 in the Mémoires de la Société de Physique et d'Histoire Naturelle de Genève, under the title of "De l'action des huiles sur le gaz oxygène à la température atmosphérique." After examining the action of the green portions of plants, roots and flowers upon the atmosphere, M. de Saussure carried his investigation to the same parts of fruits. The result was a long paper published in 1821, in the Memoirs of the same Society, entitled "Influence des fruits verts sur l'air, avant leur maturité." He shows in this paper, that unripe fruit exercises the same influence as leaves upon the air.

Independently of his vegeto-physiological researches, M. de Saussure published some papers descriptive of minerals in the Journal de Physique. These are entitled, "Analyse du Sappare," "Sur une hydrophane imbibée de cire," "Analyse de la Dolomie," and "Sur le Sappare dur."

M. de Saussure was of a most reserved habit, the result probably of his solitary education: it is recorded of him that he seldom desired to converse with his friends on the scientific subjects occupying his attention; and so far did he carry this reserve, that even his most intimate acquaintances were generally ignorant of the nature of the papers which he proposed reading before the Society of Natural History. The same disposition prevented him from acting as Professor in the Academy of Geneva, though appointed to the Chair of Mineralogy and Geology in the year 1802. It was found impossible to overcome his repugnance to give the usual courses of lectures, though at the same time he gave evidence of his warm interest in the Academy by constantly attending its meetings. In 1814, he was elected a member of the Legislative Council of the Republic of Geneva, but he was too timid to take an active part in the debates of this body. In 1790 he became a member of the Agricultural Section of the Society of Arts, and always continued one of its most zealous supporters. He was a Foreign Member of the French Institute, of the Royal Academies of Naples, Turin and Munich; of the Institute of Fine Arts and Sciences at Amsterdam; of the Linnean Societies of Paris and London; the Wernerian Society of Edinburgh; and was elected a Foreign Member of the Royal Society in 1820. In 1842, M. de Saussure was unanimously elected President of the Scientific Congress, which met that year at Lyons, thus marking the high esteem in which he was held as a man of science. Having preserved throughout life the best health, M. de Saussure died on the 18th of April 1845, at the advanced age of 78, leaving behind him the reputation of a long life passed in severe and patient study, interrupted only when he came before the world with the results of his laborious experiments and researches.

The thanks of the Meeting were given to the President for his Address, with a request that he would allow it to be printed.

The Statutes relating to the election of Council and Officers having been read by the Secretary, and Joseph Smith and Samuel Solly, Esqs. having, with the consent of the Society, been nominated Scrutators in examining the lists, the votes of the Fellows present were collected.

Dr. Roget, on the part of the Scrutators, reported the following Noblemen and Gentlemen as being duly elected Officers and Council for the ensuing year, viz.—

President.—The Marquis of Northampton.

Treasurer.—George Rennie, Esq., V.P.

Secretaries. { Peter Mark Roget, M.D.
Samuel Hunter Christie, Esq., M.A.

Foreign Secretary.—Lieut.-Col. Edward Sabine, R.A.

Other Members of the Council.—John Bostock, M.D.; Sir William Burnett, M.D., K.C.H., V.P.; Charles Daubeny, M.D.; Bryan Donkin, Esq.; Very Rev. Dean of Ely, V.P.; Thomas Galloway, Esq., M.A.; William Robert Grove, Esq., M.A.; Leonard Horner, Esq., V.P.; Sir J. W. Lubbock, Bart., M.A., V.P.; John Forbes Royle, M.D.; William Sharpey, M.D.; William Henry Smyth, Capt. R.N.; John Taylor, Esq.; Charles Wheatstone, Esq.; Rev. Robert Willis, M.A.; Lord Wrottesley, V.P.

The thanks of the Meeting were given to the Scrutators for their trouble in examining the lists.

The following is the statement of the Receipts and Payments of the Society during the preceding year, which was laid on the table by the Treasurer:—

Statement of the Receipts and Payments of the Royal Society between Nov. 29, 1844, and Nov. 29, 1845.

RECEIPTS.

				£	s.	d.
Balance in the hands of the Treasurer at the last Audit ..				1940	12	8
20 Weekly Contributions, at one shilling	52	0	0			
239 Quarterly Contributions at £1..........	958	0	0			
				1010	0	0
23 Admission Fees				230	0	0
5 Compositions for Annual Payments at £40				200	0	0
7 Compositions for Annual Payments at £60				420	0	0
One year's rent of lands at Acton: due at Michaelmas 1845	70	0	0			
Half year's Income Tax	1	0	5			
				68	19	7
One year's rent of estate at Mablethorpe: due at Michaelmas 1844............................				125	0	0
Two years' Fee farm rent of lands in Sussex: due at Michaelmas 1844–45..........................				38	8	0
One-fifth of the clear rent of an estate at Lambeth Hill, from the Royal College of Physicians, in pursuance of Lady Sadleir's will: due at Midsummer 1845				3	0	0
Dividends on Stock:—						
One year's dividend on £14,000 Reduced 3 per cent. Annuities	420	0	0			
Less Income Tax	12	5	0			
				407	15	0
One year's dividend on £1000 3 per cent. Consols	30	0	0			
Less Income Tax	0	17	6			
				29	2	6
Half year's dividend on £1000 3 per cent. Consols	15	0	0			
Less Income Tax	0	8	9			
				14	11	3
One year's dividend on 3452*l.* 1*s.* 1*d.* Consols, the produce of the sale of the premises in Coleman-street	103	11	2			
Less Income Tax	3	0	4			
				100	10	10
One year's dividend on £200 Consols	6	0	0			
Less Income Tax	0	3	6			
				5	16	6
Carried forward				4593	16	4

	£	s.	d.	£	s.	d.
Brought forward				4593	16	4
Donation Fund.						
One year's dividend on £4843 14*s.* 7*d.*	145	6	2			
Less Income Tax	4	4	10			
				141	1	4
Rumford Fund.						
One year's dividend on 2292*l.* 11*s.* 7*d.* Consols	68	15	6			
Less Income Tax	2	0	0			
				66	15	6
Fairchild Fund.						
One year's dividend on £100 New South Sea Annuities				3	0	0
Sir Clifton Wintringham's Bequest.						
One year's dividend on £1200 Consols	36	0	0			
Less Income Tax	1	1	0			
				34	19	0
Miscellaneous Receipts:—						
Sale of Philosophical Transactions, Abstracts of Papers, and Catalogues of the Royal Society's Library				206	1	7
J. D. Gilbert, Esq., Pedestal for Bust of the late D. Gilbert, Esq.				20	10	6
James Watt, Esq., two Pedestals for Busts of Sir I. Newton, and the late James Watt, Esq.				41	0	0
Mr. Galloway for Books				1	9	0
Mr. Children for ditto				1	18	0
Total Receipts				£5110	11	3

PAYMENTS.

	£	s.	d.	£	s.	d.
Fairchild Lecture.—The Rev. J. J. Ellis, for delivering the Fairchild Lecture for 1845				3	0	0
Bakerian Lecture.—Charles Daubeny, M.D., for the Bakerian Lecture for 1845				4	0	0
Books purchased:						
Dulan and Co.: for Books	105	3	3			
Nutt: for ditto	3	4	6			
Taylor: for ditto	23	17	3			
Gould: for ditto	3	3	0			
Executors of J. H. Henderson, Esq.: for ditto	8	9	6			
Executors of F. Baily, Esq.: for ditto	7	17	6			
Westley: for ditto	8	0	0			
Mrs. Loudon: for ditto	16	3	6			
				175	18	6
Carried forward				182	18	6

	£	s.	d.	£	s.	d.
Brought forward				182	18	6
Salaries:—						
Dr. Roget, one year, as Secretary	105	0	0			
S. H. Christie, Esq., one year, as Secretary..	105	0	0			
Ditto for Index to Phil. Trans.	5	5	0			
Executors of John F. Daniell, Esq., one year, as For. Sec.	20	0	0			
Charles R. Weld, Esq., one year, as Assistant-Secretary and Librarian................	200	0	0			
Ditto, for compiling Catalogue of Maps, Charts, Engravings, &c................	30	0	0			
Mr. White, one year, as Attendant.........	80	0	0			
G. Holtzer, one year, as Porter	30	0	0			
Ditto, for extra Porterage	10	0	0			
				585	5	0
Purchase of £138 0*s*. 10*d*. 3 per cent. Consols (Rumford Fund)				133	11	0
Purchase of £1000 3 per cent. Consols				1003	15	0
Fire Insurance, on the Society's Property				45	1	6
Mrs. Coppard: Gratuity.............................				10	0	0
Clerks: Christmas Fee...............................				1	1	0
Mr. Moore: Gratuity				10	0	0
Bills:—						
Taylor:						
Printing the Phil. Trans., 1844, part 2 ..	211	0	4			
Ditto, 1845, part 1..................	132	7	6			
Ditto, Proceedings, Nos. 58—60; Circulars, Lists of Fellows, Ballot-lists, Statement of Payments, and Minutes of Council; &c. &c.	58	16	6			
				402	4	4
Bowles and Gardiner:						
For Paper for the Phil. Trans., 1844, part 2,	85	4	0			
and 1845, part 1	58	16	0			
				144	0	0
Gyde:						
Boarding and Sewing 800 Parts of Phil. Trans., 1844, part 2	27	6	8			
Ditto, 1845, part 1..................	27	5	4			
				54	12	0
Tuckett:						
Bookbinding	44	18	1			
Pouncey and Sons:						
For Stationery	5	8	3			
Saunderson:						
For Shipping Expenses	9	9	1			
Carried forward	59	15	5	2572	8	4

	£	s.	d.	£	s.	d.
Brought forward	59	15	5	2572	8	4
Brecknell and Turner:						
Candles, and Lamp Oil	39	6	3			
Arnold:						
For Coals	25	16	0			
Ditto (Porter's yearly allowance)	4	7	0			
Edis:						
For making Map Cases	16	18	3			
Shoolbred:						
For Moreen	10	11	0			
Gwillim:						
Mats, Brushes, Fire-wood, &c.	6	15	9			
Cubitt:						
For repairs and relaying Carpets, &c.......	29	14	11			
Luck, Kent and Co.:						
Carpets	17	0	0			
Humphries:						
Livery for Porter	5	10	0			
				215	14	7
Taxes and Parish Rates:						
Land and Assessed Taxes	21	14	2			
Income Tax	4	19	2			
				26	13	4
Mr. Westmacott, Four Pedestals for Busts				82	0	0
Mr. Newton, Surveying Land at Acton, &c.				36	13	0
Petty Charges:						
Advertising	2	10	0			
Postage and Carriage....................	22	15	10			
Expenses on Foreign Packets, &c.	10	3	2			
Stamps	1	12	6			
Charwoman's Wages	27	14	6			
Ditto, Extra work	2	12	6			
Miscellaneous expenses	33	1	8			
				100	10	2
Balance in the hands of the Treasurer				2076	11	10
Total....				£5110	11	3

JOHN W. LUBBOCK, *Treasurer.*

November 29*th*, 1845.

The Balances in hand, now belonging to the several trusts, are as under: viz.—

	£	s.	d.
Donation Fund	313	18	7
Rumford Fund	66	15	6

The following table shows the progress and present state of the Society with respect to the number of Fellows:—

	Patron and Honorary.	Foreign.	Having compounded.	Paying £2 12s. Annually.	Paying £4 Annually.	Total.
November 1844....	13	49	507	22	233	824
Since elected........	......	......	+ 12	......	+ 11	+23
Since compounded	......	......	+ 2	......	− 2	
Defaulters	......	......	......	−1	− 3	−4
Since deceased	......	−1	− 8	−2	− 4	−15
November 1845....	13	48	513	19	235	828

Weekly and Quarterly Contributions.

1830...........................	£363	4	0
1831...........................	286	0	0
1832...........................	255	6	0
1833...........................	283	7	6
1834...........................	318	18	6
1835...........................	346	12	6
1836...........................	495	0	0
1837...........................	531	0	0
1838...........................	599	4	0
1839...........................	666	16	0
1840...........................	767	4	0
1841...........................	815	12	0
1842...........................	910	8	0
1843...........................	933	16	0
1844...........................	1025	16	0
1845...........................	1010	0	0

January 8, 1846.

The MARQUIS OF NORTHAMPTON, President, in the Chair.

The following paper was read:—

"Experimental Researches in Electricity." By Michael Faraday, Esq., D.C.L., F.R.S. &c. Twentieth Series. Section 26th. "On New Magnetic Actions; and on the Magnetic Condition of all Matter."

The following is the order in which the several divisions of the subject treated of in this section of the author's researches in electricity succeed one another:—1. Apparatus required. 2. Action of magnets on heavy glass. 3. Action of magnets on other substances acting magnetically on light. 4. Action of magnets on the metals generally. 5. Action of magnets on the magnetic metals and their compounds. 6. Action of magnets on air and gases. 7. General considerations.

In giving an account of the contents of this paper, any attempt to follow the track of the author in the precise order in which he relates the consecutive steps of his progress in this new path of discovery, would fail of accomplishing its object; for, by adhering to such a course, it would scarcely be possible to comprise within the requisite limits of an abstract the substance of a memoir extending, as the present one does, to so great a length, and of which so large a portion is occupied with minute and circumstantial details of experiments; or to succeed in conveying any clear and distinct idea of the extraordinary law of nature brought to light by the author, and of the important conclusions which he has deduced.

One of the simplest forms of experiment in which the operation of this newly-discovered law of magnetic action is manifested, is the following:—A bar of glass, composed of silicated borate of lead, two inches in length, and half an inch in width and in thickness, is suspended at its centre by a long thread, formed of several fibres of silk cocoon, so as to turn freely, by the slightest force, in a horizontal plane, and is secured from the agitation of currents of air by being enclosed in a glass jar. The two poles of a powerful electro-magnet are placed one on each side of the glass bar, so that the centre of the bar shall be in the line connecting the poles, which is the line of magnetic force. If, previous to the establishment of the magnetic action, the position of the bar be such that its axis is inclined at half a right angle to that line, then, on completing the circuit of the battery so as to bring the magnetic power into operation, the bar will turn so as to take a position at right angles to the same line; and, if disturbed, will return to that position. A bar of bismuth, substituted for the glass bar, exhibits the same phenomenon, but in a still more marked manner. It is well known that a bar of iron, placed in the same circumstances, takes a position coincident with the direction of the magnetic forces; and therefore at right angles with the position taken by the bar of bismuth subjected to the same influence. These two directions are termed by the author *axial* and *equatorial*; the former being that taken by the iron, the latter that taken by the bismuth.

Thus it appears that different bodies are acted upon by the magnetic forces in two different and opposite modes; and they may accordingly be arranged in two classes; the one, of which iron is the type, constituting those usually denominated *magnetics*; the other, of which bismuth may be taken as the type, obeying a contrary law, and therefore coming under the generic appellation of *diamagnetics*. The author has examined a vast variety of substances, both simple and compound, and in a solid, liquid, or gaseous form, with a view to ascertain their respective places and relative order with reference to this classification. The number of simple bodies which belong to the class of magnetics is extremely limited, consisting only of iron, which possesses the magnetic property in an eminent degree, nickel, cobalt, manganese, chromium, cerium, titanium, palladium, platinum and osmium. All other bodies, when either solid or liquid, are diamagnetic; that is, obey the same law, with regard to magnetic action, as bismuth, but with various degrees of intensity: arsenic is one of those that give the feeblest indications of possessing this property. The following exhibit it in increasing degrees, according to the order in which they are here enumerated; namely, ether, alcohol, gold, water, mercury, flint glass, tin, lead, zinc, antimony, phosphorus, bismuth. On the other hand, no gaseous body of any kind, or in any state of rarefaction or condensation, affords the slightest trace of being affected by magnetic forces. Gases may therefore be considered as occupying the neutral point in the magnetic scale, intermediate between magnetic and diamagnetic bodies.

The magnetic properties of compound bodies depend on those of their elements; and the bodies are rendered either magnetic or diamagnetic according to the predominance of one or other of these conditions among their constituent parts. Thus iron is found to retain its magnetic power when it has entered into combination with other bodies of the diamagnetic class; the two forces acting in opposition to one another, and the resulting effect being only that due to the difference in their power. Hence the oxides and the salts of iron are still in a certain degree magnetic, and the latter even when they are held in solution by water; but the water may be present in such a proportion as that neither shall prevail; and the solution, as far as respects its magnetic properties, will then be exactly neutralized. These saline solutions, prepared of various degrees of strength, also afford a convenient method of comparing the relative degrees of force, both magnetic and diamagnetic, of different bodies, whether solid or fluid, but more especially the latter, as they admit of the body under examination being suspended in another liquid, when its position of equilibrium will indicate which of the two substances has the strongest magnetic power.

In one respect, indeed, the diamagnetic action presents a remarkable contrast with the magnetic; and the difference is not merely one of degree, but of kind. The magnetism of iron and other magnetics is characterized by polarity; that of diamagnetics is devoid of any trace of polarity; the particles of two bodies of the latter class, when jointly under the influence of the magnetic forces, manifest towards each other no action whatever, either of attraction or repulsion. It has long been known that the magnetism of iron is impaired by heat; and it has been generally believed that a certain degree of heat destroys it entirely. The author finds, however, that this opinion is not correct; for he shows that, by applying more powerful tests than those which had been formerly confided in, iron, nickel and cobalt, however high their temperature may be raised, still retain a certain amount of magnetic power, of the same character as that which they ordinarily possess. From the different temperatures at which the magnetic metals appear to lose their peculiar power, it had formerly been surmised by the author that all the metals would probably be found to possess the same character of magnetism, if their temperature could be lowered sufficiently; but the results of the present investigation have convinced him that this is not the case, for bismuth, tin, &c. are in a condition very different from that of heated iron, nickel or cobalt.

The magnetic phenomena presented by copper and a few other metals are of a peculiar character, differing exceedingly from those exhibited by either iron or bismuth, in consequence of their being complicated with other agencies, arising from the gradual acquisition and loss of magnetic power by the iron core of the electro-magnet, the great conducting power of copper for electric currents, and its susceptibility of being acted upon by induced currents of magneto-electricity, as described by the author in the first and second series of these researches. The resulting phenomena are to all appearance exceedingly singular and anomalous, and would seem to be explicable only on the principles referred to by the author.

Pursuing his inductive inquiries with a view to discover the primary law of magnetic action from which the general phenomena result, the author noticed the modifications produced by different forms given to the bodies subjected to experiment. In order that these bodies may set either axially or equatorially, it is necessary that their section, with reference to the plane of revolution, be of an elongated shape: when in the form of a cube or sphere they have no disposition to turn in any direction: but the whole mass, if magnetic, is attracted towards either magnetic pole; if diamagnetic, is repelled from them. Substances divided into minute fragments, or reduced to a fine powder, obey the same law as the aggregate masses, moving in lines, which may be termed *diamagnetic curves*, in contradistinction to the ordinary magnetic curves, which they everywhere intersect at right angles. These movements may be beautifully seen by sprinkling bismuth in very fine powder on paper, and tapping on the paper while subjected to the action of a magnet.

The whole of these facts, when carefully considered, are resolvable, by induction, into the general and simple law, that while every particle of a magnetic body is attracted, every particle of a diamagnetic body is repelled, by either pole of a magnet. These forces continue to be exerted as long as the magnetic power is sustained, and immediately cease on the cessation of that power. Thus do these two modes of action stand in the same general antithetical relation to one another as the positive and negative conditions of electricity, the northern and southern polarities of ordinary magnetism, or the lines of electric and of magnetic force in magneto-electricity. Of these phenomena, the diamagnetic are the most important, from their extending largely, and in a new direction, that character of duality which the magnetic force was already known, in a certain degree, to possess. All matter, indeed, appears to be subject to the magnetic force as universally as it is to the gravitating, the electric, the cohesive and the chemical forces. Small as the magnetic force appears to be in the limited field of our experiments, yet when estimated by its dynamic effects on masses of matter, it is found to be vastly more energetic than even the mighty power of gravitation, which binds together the whole universe: and there can be no doubt that it acts a most important part in nature, and conduces to some great purpose of utility to the system of the earth and of its inhabitants.

Towards the conclusion of the paper, the author enters on theoretical considerations suggested to him by the facts thus brought to light. An explanation of all the motions and other dynamic phenomena consequent on the action of magnets on diamagnetic bodies might, he thinks, be offered on the supposition that magnetic induction causes in them a state the reverse of that which it produces in magnetic matter: that is, if a particle of each kind of matter were placed in the magnetic field, both would become magnetic, and each would have its axis parallel to the resultant of magnetic force passing through it; but the particle of magnetic matter would have its north and south poles opposite to, or facing the contrary poles of the inducing magnet; whereas, with the diamagnetic particles, the reverse would obtain; and hence there would result, in the one substance, approximation; in the other, recession. On Ampère's theory, this view would be equivalent to the supposition that, as currents are induced in iron and magnetics, parallel to those existing in the inducing magnet or battery wire, so, in bismuth and other diamagnetics, the currents induced are in the contrary direction. As far as experiment yet bears upon such a notion, the inductive effects on masses of magnetic and diamagnetic metals are the same.

January 15, 1846.

The MARQUIS OF NORTHAMPTON, President, in the Chair.

James B. Neilson, Esq. was elected a Fellow of the Society.

"On the Viscous Theory of Glacier Motion." By James D. Forbes, Esq., F.R.S. &c. Part II. "An attempt to establish by observation the Plasticity of Glacier Ice."

The first two sections of the present memoir are occupied with a critical examination of the theory advanced by De Saussure to account for the progressive motion of glaciers, which he considered as formed of masses of rigid and inflexible ice, and with the further explanations of that theory given by Ramaud, Bischoff, Agassiz, and Studer. The author, on the other hand, regarding these masses as possessing a considerable degree of plasticity, explains on that supposition the phenomena they present; and, in the third section of the paper, he relates a series of experiments which he carried on in the Mer de Glace, near Chamouni, in the summer of 1844, with a view to determine by direct measurement the relative motion of different parts of the glacier. This he accomplished by selecting a spot on the western side of the Mer de Glace, between Trelaporte and l'Angle, where the ice was compact and free from fissures, and erecting on the surface a row of posts at short distances from one another, in a line transverse to the general direction of the moving mass. He was thus enabled to discover by trigonometrical observations the movements of different points in this line; and he ascertained that they advanced more and more rapidly in proportion as they were distant from the sides of the glacier; and that when not under the influence of neighbouring *crevasses*, these motions were gradual and uninterrupted; as was shown by the lines carried through the posts forming, after the lapse of a few days, a continuous curve, of which the convexity was turned towards the lower end of the glacier.

"An Account of the Southern Magnetic Surveying Expedition." By Lieut. H. Clerk, R.A., in a letter to Lieut.-Colonel Sabine, R.A., F.R.S. Communicated by Lieut.-Colonel Sabine.

The letter, which is dated from the Magnetical Observatory at the Cape of Good Hope, June 28, 1845, reports the return to the Cape of the Pagoda from her voyage to the high southern latitudes after the successful completion of the magnetical service on which she had been employed by direction of the Lords Commissioners of the Admiralty, at the request of the President and Council of the Royal Society.

January 22, 1846.

SIR WILLIAM BURNETT, V.P. in the Chair.

Golding Bird, M.D., the Rev. James Booth, D.D., Richard Dugard Grainger, Esq., and Theophilus Thompson, M.D., were elected Fellows of the Society.

"On the Supra-renal, Thymus and Thyroid Bodies." By John Goodsir, Esq. Communicated by Richard Owen, Esq., F.R.S. &c.

In this paper, the author enters on the developement of the theory he advanced two years ago with regard to the origin and nature of the supra-renal, thymus and thyroid bodies, and the correctness of which, with certain modifications, he has been enabled to confirm by subsequent observation and reflection. His hypothesis was that the three organs in question are the remains of the blastoderma; the thyroid being the developement of a portion of the original cellular substance of the germinal membrane grouped around the two branches of the omphalo-mesenteric vein; the supra-renal capsules, the developements of other portions grouped around the omphalo-mesenteric arteries; and the thymus, the developement of the intermediate portion of the membrane arranged along the sides of the embryonic visceral cavity. He has since ascertained, however, that the thyroid body derives its origin in a portion of the included *membrana intermedia* remaining in connexion with anastomosing vessels between the first and second aortic arches, or carotid and subclavian vessels. He considers these organs as essentially similar in their structure, as well as in their origin in continuous portions of the blastoderma situated along each side of the spine, and extending from the Wolfian bodies to the base of the cranium: the developement of the supra-renal capsules having relation to the omphalo-mesenteric vessels; the thymus, to the jugular and cardinal veins and ductus Cuvieri; and the thyroid gland, to the anastomosing branches of the first and second aortic arches. The functions of these organs he regards as being analogous to those of the blastoderma; with this difference, however, that as the blastoderma not only elaborates nourishment for the embryo, but absorbs it also from without, that is, from the yolk, the developed organs only elaborate the matter which has already been absorbed by the other parts, and is now circulating in the vessels of the more perfect individual.

January 29, 1846.

GEORGE RENNIE, Esq., Treasurer and V.P., in the Chair.

William Addison, Esq., and George Buist, Esq., were elected Fellows of the Society.

"On the Use of the Barometric Thermometer for the determination of Relative Heights." By James R. Christie, Esq. Communicated by S. Hunter Christie, Esq., Sec. R.S., &c.

The objects of this communication, as stated by the author, are, first, to show the theoretical foundation of the very simple law pointed out by Professor Forbes, according to which the difference of the boiling temperature of water at two stations is connected with their difference of level; and next, to test the accuracy of this law by a comparison of results deduced from his own observations on the boiling-point of water at different stations among the Alps of Savoy, Piedmont and Switzerland, with the heights of the same stations as determined by other observers and by different means; and thus to arrive at a just conclusion with respect to the value of the barometric thermometer as an instrument for determining differences of level.

Combining DeLuc's formula reduced to English units,

$$b = \frac{99}{\cdot 899} \log 10\beta - 60\cdot 804,$$

where b is the variable boiling-point on Fahrenheit's scale and β the corresponding barometric pressure, with the formula of Laplace for the determination of the difference in level of two stations from barometric observations, he obtains the formula

$$\mathrm{H} = 547\cdot 99\,(b - b')\left\{1 + (t - 32^\circ)\cdot 00222\right\},$$

where b and b' are the boiling-points on Fahrenheit's scale at the two stations, t the mean temperature of the air at the stations, and H their difference of level in English feet.

The author describes the particular instrument he employed in his observations, and his mode of determining the correction which it required: he then gives, in a table, the observations he made on the boiling-point of water at thirty-eight different stations in the Alps, the heights of the corresponding stations above the sea level, deduced from these observations, and, for the purpose of comparison, the heights of the same stations deduced by other observers. The difference between these and some of the author's results are considerable; but as they are not greater than would probably arise from ordinary barometric measurements, and as there is a close accordance between his results and the determinations on which the greatest reliance can be placed, he concludes that the results are on the whole satisfactory. Considering it, however, desirable to obtain some test of the accuracy of each observation independently of the rest of the series, the author avails himself of the barometric observations made at the Observatory at Geneva and at the Convent of the Great St. Bernard; and determining from these the corresponding temperature of boiling water, deduces the difference of level between each of his stations and these two places considered as fixed points: the sum of the height above Geneva and the depression below the Great St. Bernard should in all cases be the difference of level between the two fixed stations. Although there are here again considerable discrepancies, yet in most cases where the height of the station may be considered as well-established, the height deduced from the observations agrees with it in a very remarkable manner.

In another table, the author gives the difference of level between the Observatory at Geneva and the Great St. Bernard, deduced from the recorded observations at those places simultaneous with his own at his various stations; and then remarks that the differences of height determined by the two methods do not differ from one another, in any single case, by so large a quantity as do the greatest and least differences of height deduced from the barometric observations; while in many cases the accordance is almost perfect.

The conclusion drawn from the comparisons in these tables is, that the barometric thermometer is capable of affording highly accurate and satisfactory results, perhaps even more so than the common form of barometer, but that there is considerable uncertainty attached to its indications. This uncertainty, far from being wholly attributable to the imperfections of the instrument as a measure of the atmospheric pressure, might, the author thinks, arise from an extreme susceptibility to rapid changes in that pressure, which remain unindicated by the more sluggish barometer.

"On the Decomposition and Analysis of the Compounds of Ammonia and Cyanogen." By Robert Smith, Esq., Ph. D. Communicated by Captain William Henry Smyth, R.N., F.R.S.

This paper is divided into four parts; the first relates to the decomposition of ammonia and its compounds by the compounds of chlorine, and the collection and measurement of the nitrogen gas which is disengaged, the amount of which the author considers as furnishing a ready and accurate mode of estimating the quantity of ammonia in the solution subjected to analysis. The chloride of lime was the salt usually employed for this purpose: this method is regarded by the author as being peculiarly applicable to the analysis of organic substances.

The second part treats of the decomposition and estimation of hydrocyanic acid and its compounds by means of chloride of lime, yielding nitrogen gas and carbonate of lime; a process which occupies but a few seconds. In some cases, the employment of chloride of soda is preferable to that of chloride of lime, on account of the solubility of all the compounds that are formed. The author found the same method applicable also to the analysis of the salts of cyanogen; for the cyanides of the alkalies are decomposed by it as rapidly as the pure acid itself. The ferro-cyanides are also very readily decomposed.

The author, in the third part of his paper, relates the results of his trials of the hypochlorites as agents for the decomposition of uric acid, which proved so satisfactory as to induce him to believe that these salts might be advantageously used as solvents of uric calculi in the living bladder. He also proposes the employment of chloride of lime as a ready and accurate mode of estimating the quantity of nitrogen contained in urine, from the amount of gas disengaged by its action on the nitrogenous compounds. In the last part, the apparatus used in the experiments is described.

"On a point connected with the dispute about the invention of Fluxions." By Augustus De Morgan, Esq., M.A., F.R.A.S., &c. Communicated by Samuel Hunter Christie, Esq., Sec. R.S., &c.

An assertion made by Sir Isaac Newton in a letter to Conti, published in Raphson's History of Fluxions, that the materials of the *Commercium Epistolicum* were "collected and published by a numerous Committee of gentlemen of *different nations*, appointed by the Royal Society for that purpose," appeared to be at variance with the list of the Committee as it was appointed on the 6th of March, 1711-12, and which only contains the names of Arbuthnot, Hill, Halley, Jones, Machin and Burnet, who were all English. But on further search of the records of the Society with the aid of Mr. Weld, the Assistant Secretary, the author ascertained that other members were subsequently added to the Committee, among whom were Bonet, the Prussian minister, and De Moivre, both of whom were foreigners; thus showing that the imputations which might have been cast on Newton's veracity are groundless.

February 5, 1846.

GEORGE RENNIE, Esq., Treasurer and V.P., in the Chair.

Samuel Cooper, Esq. was elected a Fellow of the Society.

"On the Secretory Apparatus and Function of the Liver." By C. Handfield Jones, M.D. Communicated by Sir Benjamin C. Brodie, Bart., F.R.S.

The author is led by his researches into the minute structure of the liver, to results which confirm the view of Mr. Bowman, in opposition to those of Mr. Kiernan on this subject; and particularly with regard to the absence of real tubercular ducts from the interior of the lobules. He concludes that the secreting process commences in the rows of epithelial cells surrounding the central axis of the lobule, and that the fluid there secreted is transmitted to the cells forming the margin of the lobule, where it is further elaborated, and, by the bursting of these cells, is conveyed into the cavity of the surrounding duct. A few diagrams are annexed, illustrative of the descriptions of microscopic structure given in the paper.

"An Account of some Experiments on the Electro-Culture of Farm Crops." By Mr. William Sturgeon. Communicated by S. Hunter Christie, Esq., Sec. R.S., &c.

Grass grown on a parallelogram of land, fifty-five yards long by twenty-two yards wide, enclosed by underground wires, was found to be much more abundant than in any other part of the field; especially in a plot "upwards of fifty yards long, whose breadth was within the wires, and nearly at right angles to the axis of the parallelogram." This plot of grass was principally on the western side of the wires, and extended but a very little way on the eastern side. The axis of the wire-enclosed parallelogram was in the magnetic meridian.

"On the Comet of 1844–45." By John Collingwood Haile, Esq. Communicated by Charles Terry, Esq., F.R.S.

The author gives a series of observations, accompanied by a diagram, made by him at Auckland, in New Zealand, on the comet of 1844–45, which there appeared on the 20th of December 1844 and disappeared on the 30th of January following, having been visible forty-two days. Its most remarkable feature was, that during its greatest brilliancy, the nucleus was not surrounded by the nebulous matter, but was situated at the very extremity of the head, and at times even appeared quite detached.

February 12, 1846.

GEORGE RENNIE, Esq., Treasurer and V.P., in the Chair.

"A Practical Extension of the application of the Law of Mortality announced by B. Gompertz, Esq., in the Philosophical Transactions for 1823." By A. M. Drach, Esq. Communicated by B. Gompertz, Esq., F.R.S.

In endeavouring to verify the theoretical law of mortality, announced by Mr. Gompertz, by means of constants derived from the results of the English census of 1841, which are contained in the sixth Annual Report of the Registrar-General, and which furnish an extended basis for computation, the author found the accordance between the two to be so remarkably close as to justify the assumption that Mr. Gompertz's formula expresses the true law of the decrement of human life. The paper is occupied with the analytical details of this investigation.

"On Spontaneous Nitrification." By C. F. Schœnbein, Professor of Chemistry in the University of Bâle. Communicated by Michael Faraday, Esq., D.C.L., F.R.S., &c.

From various facts adduced by the author, he is led to the conclusion, that during the slow combustion of phosphorus in moist atmospheric air, while ozone is produced, there is also formed a quantity of nitric acid; and that in all cases where both these compound bodies are simultaneously generated, however different may be the concomitant circumstances of the experiment, there is strong reason to suspect that the formation of the one is in some way connected with that of the other.

"On the Process of Etching, or Engraving, by means of Voltaic Electricity." By James H. Pring, M.D. Communicated by P. M. Roget, M.D., Sec. R.S.

The author, referring to an account which he gave of his method of etching on hardened steel plates, or other polished metallic surfaces, by means of electricity, in the Philosophical Magazine for November 1843, offers some additional observations relating to the theory of the process, and states some further practical remarks in its application to engraving. A specimen of a steel plate, and of a razor, on which ornamental designs were engraved by this method, were laid before the Society, in illustration.

February 19, 1846.

The MARQUIS OF NORTHAMPTON, President, in the Chair.

James Matheson, Esq., William West, Esq., and John Wilson, M.D., were elected Fellows of the Society.

"On the Mechanism of Respiration." By Francis Sibson. Communicated by Thomas Bell, Esq., F.R.S.

This paper is almost entirely occupied with anatomical details, collected from an extensive series of dissections of the muscles and bones concerned in the act of respiration in man and the lower animals, for the purpose of elucidating the mechanism of their action both in inspiration and in expiration; accompanied by a great number of illustrative diagrams and drawings. The author commences with the serpent tribes, which present the simplest form of ribs, being attached only at their vertebral ends, while their anterior ends are free. When these ribs are brought forwards by the action of the levatores costarum and external intercostal muscles, the chest is expanded; and when drawn backwards by the long depressors, internal intercostals and transversales, expiration is effected. In birds there are added to the former apparatus a sternum, and a series of sternal ribs, the respiratory movements of which are performed in directions the reverse of those of the vertebral ribs. During inspiration, the angles between the vertebral and sternal ribs become more open; the sternum moves forwards, and the spinal column slightly backwards, by the combined action of the scaleni and sterno-costal muscles on the first vertebral and first sternal ribs respectively; of the levatores costarum and external intercostal on all the lower vertebral ribs, and of the sternal intercostals on all the lower sternal ribs. On expiration these movements are reversed by the action of the internal intercostals, the external and internal oblique, recti, transversales and other muscles. The mechanism in the Mammalia is further assisted and modified by the addition of a large and powerful diaphragm. The thoracic ribs are articulated with the sternum by the medium of cartilages corresponding to the sternal ribs of birds: those ribs which are connected with the inferior curve of the dorsal arch have floating cartilages, and may be considered as a diaphragmatic set of ribs. When raised, the former approach each other, and the latter recede from each other anteriorly. Intermediate to these are the longer ribs connected with the dorsal arch, having their cartilages united, and articulated with the lower end of the sternum. The scaleni muscles invariably act during the whole time of inspiration. The external intercostals between the thoracic ribs are also throughout inspiratory; but those portions which are situated between their cartilages are expiratory; and those between the diaphragmatic ribs are inspiratory behind, expiratory to the side, and in front, and inspiratory between their cartilages. Between the intermediate ribs, they are for the most part slightly inspiratory between the ribs, and expiratory in front, between the cartilages. The external intercostals of the thoracic ribs are expiratory behind, and inspiratory in front, if the ribs approach these, and are inspiratory between their costal cartilages. Between the diaphragmatic and intermediate sets of ribs, and between their cartilages they are throughout expiratory. The levatores costarum draw the posterior portion of the lower ribs backwards. In the ass and the dog, the upper fasciculi of the serratus magnus are expiratory, the lower inspiratory, and the intermediate neutral. In man, the greater part of the fasciculi of this muscle is expiratory. In the ass, the lower fibres of the serratus posticus inferior are inspiratory, and the upper fibres expiratory. In the dog and in man, all are throughout expiratory.